Search Report

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 958 746 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.11.1999 Bulletin 1999/47

(21) Application number: **99303937.9**

(22) Date of filing: **20.05.1999**

(51) Int Cl.[6]: **A23C 9/137**, A23L 1/0524, A23L 2/66, A23L 2/52, A23G 9/00

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **22.05.1998 JP 14097098**

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(54) Acidic protein foods and process for their production

(57) Beet-derived pectin is incorporated into acidic protein foods as a stabilizer. It is possible in this way to provide acidic protein foods with low viscosity and a light texture, which avoid the drawbacks of coagulation, precipitation, phase separation, etc. of protein particles in acidic protein foods in a wide acidity range and without producing a sticky feel.

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to acidic foods and a process for their production, and more specifically, it relates to acidic foods such as acidic protein drinks prepared by adding citrus juices or other juices, organic acids and inorganic acids to protein drinks such as lactic acid bacteria beverages, fermented milk, liquid yogurt, acidic milk beverages, acidic frozen desserts and acidic desserts, as well as milk and soybean milk, and to a process for their production.

2. Description of the Related Art

[0002] In the past, stabilizers such as high methoxy pectin (HM-pectin), sodium carboxymethylcellulose (CMC-Na) and propylene glycol alginate ester (PGA) have normally been used either alone or in combination for production of acidic protein foods in order to prevent coagulation and precipitation of protein particles. However, it is difficult for any of these stabilizers to totally prevent coagulation and precipitation of protein particles, and they sometimes produce the phenomena of phase separation, precipitation, etc. In addition, all stabilizers increase viscosity when used, and are therefore not suited to the tastes of today's consumers who prefer low viscous, light food textures. A number of modifications have been devised to give lower viscosity and prevent coagulation, precipitation and phase separation of protein particles in products, such as using water-soluble soybean polysaccharides as dispersing agents as described in Japanese Unexamined Patent Publication No. 5-7458, but when the pH of the product approaches the neutral range the stability is often lowered, and therefore products with even higher stability have been desired.

SUMMARY OF THE INVENTION

[0003] It is an object of the present invention to provide acidic protein foods with low viscosity and a light texture, which avoid the drawbacks of coagulation, precipitation, phase separation, etc. of protein particles in acidic protein foods in a wide acidity range and without producing a sticky feel.

[0004] As a result of diligent research toward overcoming the problems described above, the present inventors have found that the above-mentioned problems can be overcome by using beet-derived pectin as a stabilizer in acidic protein foods, either alone or in combination with conventional water-soluble soybean polysaccharides, HM-pectin, CMC-Na, PGA and the like. The present invention has been completed on the basis of this finding.

[0005] In other words, the present invention provides an acidic protein food containing beet-derived pectin as a stabilizer, as well as a process for producing an acidic protein food comprising adding beet-derived pectin to the acidic protein food.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0006] The acidic protein foods according to the invention are acidic foods containing animal or vegetable proteins, and these include protein products which have been rendered acidic, such as acidic milk beverages prepared by acidifying milk products, e.g. lactic acid bacteria beverages (including live bacteria and sterilized-types) and fermented milk (in solid or liquid form), acidic frozen desserts and acidic desserts, and acidic beverages prepared by adding citrus juices or other juices, or organic or inorganic acids, to beverages containing animal or vegetable proteins, such as milk and soybean milk. Animal and vegetable proteins include cow's milk, goat's milk, defatted milk, soybean milk and powdered products thereof including whole fat powdered milk, defatted powdered milk and powdered soybean milk, as well as sweetened milk containing added sugar, concentrated condensed milk, processed milk fortified with minerals such as calcium, vitamins, etc., fermented milk, and proteins derived therefrom. Fermented milk refers to fermented milk which has been fermented by sterilization of the aforementioned animal or vegetable proteins, followed by addition of a lactic acid starter, and if desired, it may be powdered or sugar may be added.

[0007] The beet pectin to be used for the invention is a polysaccharide extracted and refined from beets, and most suitably the raw material therefor is beet sugar lees remaining after production of sucrose from beets, or beets themselves, which are suspended in water and prepared under acidic conditions of pH 1-7, preferably pH 2-5, and subjected to acidic hot water extraction at a temperature of 50°C-120°C, preferably 70°C-100°C, to produce the acidic polysaccharide.

[0008] The amount of the beet pectin to be used may be generally about 0.05-10 wt%, and preferably 0.2-2 wt%, with respect to the final product, but these ranges do not restrict the scope of the invention because they may vary depending on differences in the protein concentration.

[0009] The beet pectin used to carry out the invention may be used in combination with another stabilizer such as water-soluble soybean polysaccharide, HM-pectin, CMC-Na, PGA, locust bean gum, tamarind seed polysaccharide, gelan gum, xanthan gum, guar gum, tara gum, gum Arabic, kalaya gum, carrageenan or agar, in order to supplement the insufficiencies of the stabilizers. That is, it is possible to produce acidic food products which are stable and have low viscosity and a light texture across a wide pH range.

[0010] Embodiments of the invention will now be explained through the following examples, which are only exemplary and are not intended to restrict the spirit of the invention. Throughout these examples, the parts and percentages are based on weight.

Experimental Example 1

[0011] Fermented milk-containing yogurt drinks were prepared by the following steps.

[0012] A. After adding 21 parts of defatted powder milk to 79 parts of water and dispersing, the dispersion was sterilized while stirring at 90-95°C for 15 minutes and cooled to 40°C, after which 3 parts of commercially available plain yogurt was added as a starter for 20 hours of fermentation in an incubator at 38°C, and then a homogenizer was used for card pulverization at 150 kgf/cm^2 and cooling was effected at 10-15°C to prepare fermented milk.

[0013] B. Two parts each of beet pectin, water-soluble soybean polysaccharide and HM-pectin were added to 98 parts of hot water, and after 10 minutes of stirring at 80°C to dissolution, the solution was cooled to 25°C and the evaporated water was supplemented to prepare a 2% stabilizer solution.

[0014] C. Seven parts of sugar was dissolved in 33 parts of water to prepare a sugar solution.

[0015] D. The solutions prepared above were cooled to 10-15°C and mixed in a proportion of 40 parts of the fermented milk, 20 parts of the stabilizer solution and 40 parts of the sugar solution, after which a 50% lactic acid solution or saturated sodium citrate solution was used to adjust the pH to 3.8, 4.0, 4.2 or 4.4, and a homogenizer was used for homogenization at 150 kgf/cm^2 to make fermented milk-containing yogurt drinks.

[0016] The results of evaluating the yogurt drinks are summarized in Table 1.

Table 1

Evaluation results for yogurt drinks					
Run No.	Stabilizer type	pH	Viscosity (mPa•s)	Precipitation rate (%)	Sticky feel
1	Beet pectin	3.8	10.0	0.68	○
2	Beet pectin	4.0	9.5	0.54	○
3	Beet pectin	4.2	8.0	0.48	○
4	Beet pectin	4.4	8.0	0.44	○
5	Water-soluble soybean polysaccharide	3.8	6.2	0.60	○
6	Water-soluble soybean polysaccharide	4.0	6.6	0.64	○
7	Water-soluble soybean polysaccharide	4.2	18.0	1.58	Δ
8	Water-soluble soybean polysaccharide	4.4	38.2	9.04	×
9	HM-pectin	3.8	27.6	1.38	×
10	HM-pectin	4.0	24.0	0.98	×
11	HM-pectin	4.2	27.0	0.98	×
12	HM-pectin	4.4	29.2	0.62	×

Viscosity: Measured at 10°C with a BM viscometer (Rotor No.1, 60 rpm, 1 minute).

Precipitation rate: Calculated by the following equation after centrifugation of a 50 g sample using a Kokusan centrifuge (750 G x 20 min.)

$$\text{Precipitation rate (\%)} = (\text{weight of precipitate})/\text{weight of sample}) \times 100$$

Sticky feel: The symbols indicate the following.

○: Light with absolutely no sticky feel.
Δ: Viscous with slightly sticky feel, but having product value.
× : Highly viscous with strong sticky feel, and no product value.

[0017] As shown in Table 1, when beet pectin was used as the stabilizer (Experiment Nos. 1-4) it was possible to produce fermented milk-containing yogurt drinks which were stable and had low viscosity and a light texture across a wide pH range. With water-soluble soybean polysaccharide (Experiment Nos. 5-8), however, the viscosity of the yogurt drink increased when the pH was 4.2 or higher, resulting in observation of a sticky feel and lower stability. Also, when HM-pectin was used as the stabilizer (Experiment Nos. 9-12), the viscosity was high with a strong sticky feel over the entire pH range.

Experimental Example 2

[0018] Fermented milk-containing yogurt drinks were prepared by the procedure described above and tested. However, the pH was 4.2 for all of the products, and the effects of the stabilizers used in combination were observed. The results are summarized in Table 2.

Table 2

Effect of combined use of stabilizers				
Run No.	Stabilizer ratio A:B:C	Viscosity (mPa•s)	Precipitation rate (%)	Stick feel
1	0.3:0.1:0	8.5	0.78	○
2	0.2:0.2:0	9.6	0.84	○
3	0.1:0.3:0	10.2	1.24	○
4	0.3:0:0.1	10.5	0.60	○
5	0.2:0:0.2	13.4	0.64	○
6	0.1:0:0.3	20.0	0.78	Δ

Stabilizer A: Beet pectin
Stabilizer B: Water-soluble soybean polysaccharide
Stabilizer C: HM pectin

[0019] The viscosity, precipitation rate and sticky feel were as specified in Table 1.

[0020] As shown in Table 2, it was confirmed that using beet pectin in combination provided an effect making it possible to eliminate the drawbacks of stability variation due to product pH and sticky feel, which occur when the other stabilizers are used alone.

Example 1

[0021] A lactic acid bacteria beverage was prepared with the composition listed in Table 3.

Table 3

Starting material composition	
Starting material	Parts by weight
Fermented milk	15.0
Beet pectin	0.4
Water	19.6
Sugar	7.0
Water	58.0
50% lactic acid solution	q.s.

1: Fermented milk was prepared in the same manner as Experimental Example 1. 2: After adding 0.4 part of beet pectin to 19.6 parts of hot water at 80°C and stirring at 80°C for 10 minutes until dissolved, the mixture was cooled to normal temperature and water was supplemented to prepare a 2% stabilizer solution. 3: Seven parts of sugar was added to 58 parts of water and the mixture was stirred until dissolved. 4: After combining and mixing 15 parts of the

fermented milk of 1:, 20 parts of the 2% stabilizer solution of 2: and 65 parts of the sugar solution of 3:, the pH was adjusted to 4.2 with a 50% lactic acid solution and the mixture was heated to 90°C and stirred for sterilization, after which a homogenizer was used for homogenization at 150 kgf/cm^2 and the product was collected in a container, cooled and then stored still in a refrigerator.

[0022] The product obtained in this manner was a lactic acid bacteria beverage exhibiting no precipitation or supernatant even after the course of a month, and having a non-sticky, light smooth texture.

Example 2

[0023] An orange-flavored acidic milk beverage was prepared with the composition listed in Table 4.

Table 4

Starting material composition	
Starting material	Parts by weight
Defatted powdered milk	1.0
Sugar	10.0
Beet pectin	0.2
Water-soluble soybean polysaccharide	0.2
Orange juice	10.0
10% citric acid solution	q.s.
Water	To total of 100.0

1: One part of defatted powdered milk and 10 parts of sugar were added to 35 parts of water at normal temperature, and the mixture was stirred. 2: Upon adding 0.2 part of beet pectin and 0.2 part of water-soluble soybean polysaccharide to 40 parts of hot water at 80°C, the mixture was stirred at 80°C for 10 minutes until dissolved. 3: After combining the solutions prepared in 1: and 2:, 10 parts of orange juice was added, the pH was adjusted to 3.5 with the 10% citric acid solution, and the total was brought to 100 parts with water. 4: The three-part mixture was filled for hot pack sterilization at 95°C for 30 seconds and stored still in a refrigerator.

[0024] The product obtained in this manner was an orange-flavored acidic milk bacteria beverage exhibiting no precipitation or supernatant even after the course of 3 months, and having a non-sticky, light feel.

Example 3

[0025] A fermented milk-containing yogurt drink was prepared with the composition listed in Table 5.

Table 5

Starting material composition	
Starting material	Parts by weight
Fermented milk	40.0
Beet pectin	0.3
HM-pectin	0.2
Water	24.5
Sugar	7.0
Water	28.0
Saturated sodium citrate solution	q.s.

1: Fermented milk was prepared in the same manner as Experimental Example 1. 2: After adding 0.3 part of beet pectin and 0.2 part of HM-pectin to 24.5 parts of hot water at 80°C and stirring at 80°C for 10 minutes until dissolved, the mixture was cooled to normal temperature and the evaporated water was supplemented to prepare a 2% stabilizer solution. 3: Seven parts of sugar was added to 28 parts of water and the mixture was stirred until dissolved. 4: After combining and mixing 40 parts of the fermented milk of 1:, 25 parts of the 2% stabilizer solution of 2: and 35 parts of the sugar solution of 3:, the mixture was stirred while cooling at 10-15°C, and after adjusting the pH to 4.5 with a saturated sodium citrate solution, a homogenizer was used for homogenization at 150 kgf/cm^2 and the product was collected in a container, cooled and then stored still in a refrigerator.

[0026] The product obtained in this manner exhibited no precipitation or supernatant even after the course of one week, and maintained high quality with no sticky feel and a light texture.

Example 4

[0027] An acidic frozen dessert (sherbet) was prepared with the composition listed in Table 6.

Table 6

Starting material composition	
Starting material	Parts by weight
Defatted powdered milk	1.0
Vegetable oil	1.0
Sugar	8.0
Isomerized sugar	10.0
Starch syrup	5.0
Citric acid	0.15
Beet pectin	0.5
Food coloring	0.02
Flavoring	0.1
Emulsifier	0.5
Water	To total of 100.0

1: One part of defatted powdered milk was added to 20 parts of water and stirred until dissolved. 2: Eight parts of sugar, 10 parts of isomerized sugar and 5 parts of starch syrup were dissolved in 30 parts of water. 3: After adding 0.5 part of beet pectin to 9.5 parts of hot water at 80°C and stirring at 80°C for 10 minutes until dissolved, the mixture was cooled to normal temperature and the evaporated water was supplemented to prepare a 5% beet pectin solution. 4: The 0.15 part of citric acid was dissolved in 5 parts of water, and the food coloring was diluted with a 100-fold amount of water. 5: Upon combining 21 parts of the defatted milk powder solution, 53 parts of the sugar solution, 10 parts of the beet pectin solution, 5.15 parts of the acid solution and 2 parts of the food coloring solution which were obtained in the manner described above, there were further added the 0.1 part of flavoring, 0.5 part of emulsifier and 1.0 part of vegetable oil, water was added to prepare a total of 100 parts, and then the temperature was raised to 80°C while stirring and the mixture was stored for 10 minutes, after which a homogenizer was used for homogenization at 150 kgf/cm^2 and the product was collected in a container, cooled and subsequently aged overnight at 7°C. 6: The aged homogenate was whipped using an ice cream freezer to an overrun of 60% and then taken out, filled into a cup and stored in a freezer.

[0028] The product obtained in this manner was a sherbet which exhibited no shrinkage even after being stored for one month in the freezer, dissolving readily in the mouth and having a light, pleasant texture. Also, upon observation of the condition of the homogenate which had been aged overnight in step 5:, no precipitation, supernatant or neck rings were found, indicating a satisfactory condition in storage.

Example 5

[0029] An acidic dessert (jelly) was prepared with the composition listed in Table 7.

Table 7

Starting material composition	
Starting material	Parts by weight
Lactic acid bacteria beverage (sterilized type)	20.0
Sugar	5.0
Beet pectin	0.2
Carrageenan	0.5
Locust bean gum	0.1

Table 7 (continued)

Starting material composition	
Starting material	Parts by weight
Flavoring	0.1
Water	To total of 100.0

1: Twenty parts of a lactic acid bacteria beverage prepared in the same manner as Example 1 was combined and stirred with 10 parts of water. 2: After adding 50 parts of sugar, 5 parts of carrageenan and 1 part of locust bean gum to 500 parts of hot water at 80°C and stirring at 80°C for 10 minutes until dissolved, the mixture was cooled to 50°C and the evaporated water was supplemented to prepare a gelling agent solution. 3: After adding 2 parts of beet pectin to 38 parts of hot water at 80°C and stirring at 80°C for 10 minutes until dissolved, the solution was cooled to normal temperature and the evaporated water was supplemented to prepare a 5% beet pectin solution. 4: After combining 30 parts of the lactic acid bacteria solution, 55.6 parts of the gelling agent solution and 4 parts of the 5% beet pectin solution, further adding the 0.1 part of flavoring and bringing the total to 100 parts with water, the temperature was raised to 80°C while stirring and the mixture was stored for 10 minutes, after which a homogenizer was used for homogenization at 150 kgf/cm^2 and the product was collected in a container. 5: The collected product was cooled with cold water for gelation and stored for two weeks in a refrigerator.

[0030] The jelly prepared in this manner exhibited no protein coagulation or water separation, indicating a satisfactory condition in storage.

[0031] By using beet-derived pectin as a stabilizer according to the present invention, it is possible to produce stabilized acidic protein foods with low viscosity, no sticky feel and a light texture, which are also free of the disadvantages of protein particle coagulation, precipitation and phase separation.

Claims

1. An acidic protein food containing beet-derived pectin.

2. A process for production of an acidic protein food comprising adding beet-derived pectin to the acidic protein food.

3. The use of beet-derived pectin as a stabilizer in acid protein foods.

4. The use as claimed in claim 3, wherein the beet-derived pectin is used in an amount from 0.2 to 2 wt%, with respect to the final product.

5. The use as claimed in claim 3 or claim 4, wherein the beet-derived pectin is used in conjunction with another stabilizer.

6. The use as claimed in claim 5, wherein the beet-derived pectin is used in conjunction with another stabilizer selected from water-soluble soybean polysaccharide, HM-pectin, CMC-Na, PGA, locust bean gum, tamarind seed polysaccharide, gelan gum, xanthan gum, guar gum, tara gum, gum Arabic, kalaya gum, carrageenan and agar.

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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 3937

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 September 1999	De Jong, E

CATEGORY OF CITED DOCUMENTS

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A : technological background
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EUROPEAN SEARCH REPORT

Application Number
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